ARSENIC FILTER FOR WATER OFFERS HOPE TO MILLIONS

By Jeffrey Thomas
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WASHINGTON, JULY 11 -- The winner of a prestigious engineering prize is working hard to ensure that needy communities around the world benefit from his invention, which removes arsenic and other impurities from water drawn from tube wells.

Abul Hussam, a chemistry professor at George Mason University in Virginia, has devoted most of the $1 million he was awarded as winner of the 2007 Grainger Challenge Prize to distributing his inexpensive water filtration system to the poor in countries such as his native Bangladesh, where between 77 million and 95 million people are drinking water contaminated with arsenic. The remainder of the prize money was donated to the university or set aside for more research.

Arsenic contamination is a serious problem in tube wells in Bangladesh, eastern India, Nepal and several other countries. Arsenic is poisonous and, even in low concentrations, can cause skin ailments, nerve damage, fatal cancers, organ failure and the loss of arms and legs, as well as death.

Hussam first became involved professionally in working on the arsenic problem when his brother, a physician in Kushtia, Bangladesh, asked him to develop a technique for precise arsenic measurement. As part of his research at George Mason University, Hussam developed an electrochemical analyzer and utilized it to develop a measurement protocol. "The first sample we measured was our home tube well and we found 160-190 parts per billion [ppb] -- 50 ppb is the limit -- arsenic. We then decided to develop a water filter," he said.

Hussam found that the entire neighborhood in which he grew up and 60 percent of Kushtia's 400,000 residents were drinking arsenic-contaminated water. While he and his siblings did not develop symptoms of arsenic poisoning, others in his community did.

The Grainger Challenge Prize was created by the National Academy of Engineering (NAE) with support from the Grainger Foundation. NAE challenged the U.S. engineering community to develop a water treatment system that would significantly lower the arsenic content in groundwater from tube wells in developing countries. The challenge stipulated that the winning system be low-cost, technically robust, reliable and maintainable; be socially acceptable and affordable; be manufacturable and serviceable in a developing country; and not degrade other water quality characteristics or create a toxic waste disposal hazard.

Hussam's SONO filter, as he calls it, was one of 75 entries. It was tested in a laboratory of the U.S. Environmental Protection Agency and analyzed by each of the 10 members of the prize selection committee, according to the committee's chairman, professor Charles O'Melia of Johns Hopkins University in Maryland, who called Hussam's invention "innovative."

The SONO filter works without electricity, using three stacked buckets. The top bucket is filled with coarse river sand and a composite iron matrix, which serves as the active arsenic removal component. The middle bucket contains coarse river sand and wood charcoal to remove organic impurities. The bottom bucket contains fine river sand and brick chips to remove fine particles and stabilize water flow. The SONO filter is manufactured in Bangladesh using local raw materials at a cost of $35-$40. It produces 20 liters of clean water per hour, requires little maintenance, and lasts a minimum of five years. It is also "green," in the sense that it does not produce any hazardous waste.

Hussam says he has distributed 32,500 of the filters in Bangladesh, including to more than 1,000 schools. "We are beginning to see the effect of drinking clean water on patients being cured of melanosis and keratosis [skin ailments], and most people feel better," he said. People are also more aware of the importance of clean, potable water.

"We have plans to distribute the filter in India and Nepal," Hussam said.

Hussam's work on arsenic contamination and his collaboration with others to create an environmental research laboratory in Bangladesh illustrate the synergy that can develop between U.S. institutions and those in other countries as a result of a single individual's education.

Hussam came to the United States as a graduate student in 1978, joining George Mason University's Chemistry Department after completing his doctorate at the University of Pittsburgh in Pennsylvania and doing postdoctoral research at the University of Minnesota. "Since 1983, I have been in touch with my physician brother, who was trying to develop a clinical diagnostic lab in my hometown, Kushtia. I was also helping my professors in Dhaka University to develop an electrochemistry lab and lecturing in different institutions," he said.

"The experience in the United States was of immense value," said Hussam, who became a U.S. citizen in 1978. "I must say that I had excellent colleagues here and abroad who were receptive and helpful."

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